

WHAT IS CLAIMED IS:

1. In a computerized 3D graphical image rendering system for performing visible surface determination, a method of generating depth information, comprising the steps of:

representing depth information by a piecewise function;  
upon receiving a primitive object, dividing the primitive object according to areas defined by the piecewise function;  
performing a visibility test in the areas; and  
updating the piecewise function based on the results of the visibility test.

2. The method of claim 1 wherein each piece of piecewise function is an analytical function of a predefined class defined by corresponding parameters.

3. The method of claim 2 wherein the analytical function is a linear function.

4. The method of claim 2 wherein the analytical function is a non-linear function.

5. The method of claim 1 wherein a dynamic search structure is used for fast access to the areas of a split overlapping with the primitive object.

6. The method of claim 4 wherein the dynamic search structure is a tree-based structure.

7. The method of claim 1 wherein each piece of the piecewise function is defined on a segment of a scanline.

8. An apparatus for generating depth information, comprising:  
a first module for representing depth information by a piecewise function;  
a second module for dividing a primitive object according to the areas defined by the piecewise function upon receiving the primitive object;  
a third module for performing visibility test in the areas; and  
a fourth module for updating the piecewise function based on any results of the visibility test.

9. The apparatus of claim 8 wherein the first module processes a piecewise analytical function.

10. The apparatus of claim 9 wherein the first module processes a piecewise linear function.

11. The apparatus of claim 9 wherein the first module processes a piecewise non-linear function.

12. The apparatus of claim 8 further comprising a module implementing a dynamic search structure for selectively accessing a set of the piecewise function parameters.

13. The apparatus of claim 12 wherein the dynamic search structure is a tree-based structure.

14. The apparatus of claim 8 wherein each piece of piecewise function is defined on a segment of a scanline.

15. An apparatus for performing visible surface determination of 3D images defined by a plurality of primitive objects and associated depth information, comprising:

a span generator for generating spans for each of the primitive objects, a span corresponding to each horizontal scan line occupied by the primitive object, the span characterized by positional data and depth data; and

a visible surface determination module responsive to the depth data associated with each of the spans, for determining visible segments of each of the spans, and for generating position data corresponding to each of the visible segments of each of the spans.

16. The apparatus of claim 15 further comprising a means for storing the position data corresponding to each of the visible segments of each of the spans and for causing storage of depth data corresponding to each of the visible segments of each of the spans.

17. A system for performing visible surface determination on 3D images defined by a plurality of primitive objects and associated depth information, comprising:

a processing device;

a display device coupled to the processing device for displaying the 3D images;

a graphics engine coupled to the processing device for performing visible surface determination; and

a storage device for storing results of the visible surface determination, wherein regions of the primitive objects and the associated depth information are defined by analytical functions.

18. The system of claim 17 wherein the graphics engine further comprises a span generator for generating spans corresponding to each horizontal scanline of the primitive object.

19. The system of claim 18 wherein the graphics engine further comprises a visible surface determination module coupled to the span generator for determining visible segments for each span.

20. The system of claim 17 wherein the storage device stores the results in a linked-list format.

21. The system of claim 17 wherein the storage device stores the results in a binary tree format.

22. The system of claim 17 wherein the results comprise information indicative of relative depth of a first visible segment in relations to a second visible segment.

23. A computer readable medium having embodied thereon a program, the program being executable by a machine to perform method steps for performing visible surface determination, the method steps comprising:

representing depth information of a primitive object by a piecewise function;  
upon receiving the primitive object, dividing the primitive object according to areas defined by the piecewise function;  
performing a visibility test in the areas; and  
updating the piecewise function based on the results of the visibility test.

24. A system for performing visible surface determination on 3D images defined by a plurality of primitive objects and associated depth information, comprising:

means for representing depth information by a piecewise function;  
upon receiving a primitive object, means for dividing the primitive object according to the areas defined by the piecewise function;  
means for performing a visibility test in the areas; and  
means for updating the piecewise function based on the results of the visibility test.